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| EXAMINER | |
|---|---|
| YOUNG, NATASHA E | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/528,435 | MAK, JOHN | |
| | Examiner | Art Unit | |
| | NATASHA YOUNG | 1797 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *26 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-7 and 9-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-2, 4-7, 9-11, 13, and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,354,105 B1) in view of Campbell et al (US 5,771,712).

Regarding claim 1, Lee et al discloses a natural gas liquid plant, comprising: a separator (34a) that is configured to allow separation of a cooled low pressure feed gas into a liquid portion and a vapor portion; a second cooler (26) and a second pressure reduction device (see figure 4, the valve before absorber (28a)) fluidly coupled to the separator (34a), wherein the second cooler (26) is configured to allow cooling of at least part of the vapor portion, and wherein the second pressure reduction device (see figure 4, the valve before absorber (28a)) is configured to reduce pressure of the part of the

vapor portion to a degree effective to provide the part of the vapor portion to an absorber (28a) as lean absorber reflux; and wherein the absorber (28a) is configured to produce an absorber overhead product to thereby provide refrigeration for the second cooler, and wherein the absorber is further configured to produce an absorber bottoms product, and a demethanizer fluidly coupled to the absorber and configured to receive the absorber bottoms product as lean reflux (see figure 4 and column 9, line 35 through column 10, line 14).

Lee et al does not disclose a first pressure reduction device that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion to provide refrigeration for a first cooler that is fluidly coupled to the separator and that is configured to allow cooling of a low pressure feed gas to thereby allow formation of the cooled low pressure feed gas.

Campbell et al discloses a separator (11) that is configured to allow separation of a cooled low pressure feed gas into a liquid portion, and a first pressure reduction device (12) that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion to provide refrigeration for a first cooler (10) that is fluidly coupled to the separator and that is configured to allow cooling of a low pressure feed gas to thereby allow formation of the cooled low pressure feed gas (see figure 3 and column 8, line 31 through column 9, line 4).

Campbell et al does not disclose a demethanizer.

However, Campbell et al discloses a deethanizer (17) (see figure 3).

It would have been obvious tone having ordinary skill in the art at the time the invention was made to modify the teachings of Lee et al with the teachings of Campbell et al such that a first pressure reduction device that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion to provide refrigeration for a first cooler that is fluidly coupled to the separator and that is configured to allow cooling of a low pressure feed gas to thereby allow formation of the cooled low pressure feed gas in order to substantially reduce the utility requirements (cooling, reboiling, refluxing, and/or re-compressing) needed for the recovery of the desired products (see column 2, lines 37-51).

Regarding claim 9, Lee et al discloses a natural gas liquid plant, comprising: a primary and secondary cooler (120, 80) that are configured to cool a low pressure feed gas, and a separator (34) that is configured to separate the cooled low pressure feed gas in a liquid portion and a vapor portion; a third cooler (26) that is configured to cool at least part of the vapor portion, and a pressure reduction device (100) that is configured to expand the cooled vapor portion (see figure 1 and column 4, line 56 through column 5, line 40).

In another embodiment Lee et al discloses an absorber (28a) that is configured to receive the cooled and expanded vapor portion and to produce an overhead product that provides refrigeration for a cooler (26) (see figure 4 and column 9, lines 35-64).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the embodiment of figure 1 with the embodiment of figure 4 such that an absorber that is configured to receive the cooled and expanded vapor

portion and to produce an overhead product that provides refrigeration for a cooler in order to achieve additional refrigeration on the reflux exchanger.

Lee et al does not disclose a first pressure reduction device that is configured to reduce pressure of the liquid portion to thereby provide refrigeration for the secondary cooler and an absorber that is configured to receive the cooled and expanded vapor portion and to produce an overhead product that provides refrigeration for the third cooler and a bottom product that is employed as reflux in a demethanizer.

Campbell et al discloses a first pressure reduction device (12) that is configured to reduce pressure of the liquid portion to thereby provide refrigeration for a cooler (10) and an absorber (15) that is configured to receive the cooled and expanded vapor portion and to produce an overhead product that provides refrigeration for another cooler (20) and a bottom product that is employed as reflux in a deethanizer (17) (see figure 3 and column 8, line 31 through column 9, line 32).

Campbell et al does not disclose a primary and secondary cooler and a demethanizer.

It would have been obvious tone having ordinary skill in the art at the time the invention was made to modify the teachings of Lee et al with the teachings of Campbell et al such that a first pressure reduction device that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion to provide refrigeration for a first cooler that is fluidly coupled to the separator and that is configured to allow cooling of a low pressure feed gas to thereby allow formation of the cooled low pressure feed gas in order to substantially reduce the utility requirements (cooling, reboiling,

refluxing, and/or re-compressing) needed for the recovery of the desired products (see column 2, lines 37-51) and to provide absorption cooling needed in heat exchanger to partially condense the demethanizer overhead of Lee et al without operating the demethanizer of Lee et al at a pressure significantly higher than that of the separator/absorber (see column 9, line 60 through column 10, line 19).

Regarding claims 2 and 10, Lee et al discloses a NGL plant wherein the low pressure feed gas has a pressure of about 300 psig to about 1000 psig (see column 5, lines 50-63).

Regarding claims 4 and 11, Lee et al does not disclose a NGL plant wherein the first pressure reduction device comprises a hydraulic turbine, and wherein the second pressure reduction device comprises a Joule-Thomson valve.

However, Lee et al discloses a second pressure reduction device (see figure 4).

Campbell discloses a first pressure reduction device (12) (see figure 3 and column 8, line 31 through column 9, line 4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a hydraulic turbine as the first pressure reduction device, since it was known in the art that a hydraulic turbine is an expansion device (see MPEP 2144.03 (A-E)).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a Joule-Thomson valve as the second pressure reduction device, since it was known in the art that a Joule-Thomson valve is an expansion device (see MPEP 2144.03 (A-E)).

Regarding claim 5, Lee et al does not disclose a NGL plant wherein the demethanizer is configured to receive the liquid portion that is reduced in pressure as a demethanizer feed stream.

Campbell et al discloses the deethanizer is configured to receive the liquid portion that is reduced in pressure as a deethanizer feed stream (see figure 3 and column 8, line 31 through column 9, line 4).

Campbell et al does not disclose a primary and secondary cooler and a demethanizer.

Regarding claims 6 and 13, Lee et al does not disclose a NGL plant further comprising a turboexpander that is configured to allow expansion of part of the vapor portion, and further comprising a second separator that is configured to receive the expanded part of the vapor portion and to produce a liquid that is employed as a lean demethanizer reflux and a vapor that is fed into the absorber.

However, Lee et al discloses a main portion (42a) of the vapor portion stream (36) is expanded through a work-expansion turbine (40) (see figures 1 and 4 and column 5, lines 9-20).

Campbell et al discloses a vapor portion (32) from separator (11) enters a work expansion machine (13), which expands the vapor, the expanded and partially condensed stream (32a) enters the upper section of intermediate separator (29), where the vapor portion from the separator (29) enters the separator/absorber (15) and the liquid portion enters the deethanizer (17) (see figure 2 and column 6, lines 1-65).

Campbell et al does not disclose a demethanizer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Lee et al with the teachings of Campbell et al such that a NGL plant further comprises a turboexpander that is configured to allow expansion of part of the vapor portion, and further comprises a second separator that is configured to receive the expanded part of the vapor portion and to produce a liquid that is employed as a lean demethanizer reflux and a vapor that is fed into the absorber in order to substantially reduce both the refrigeration compression load and the reboiler duty (see column 8, lines 16-30).

Regarding claim 7, Lee et al discloses at least about 90% of the C2+ hydrocarbons in said feed gas are recovered in said natural gas liquid product (see column 4, lines 43-55) such that at least 85 mol% of ethane is recovered and at least 99 mol% of propane is recovered.

Regarding claim 15, Lee et al discloses a NGL plant wherein ethane recovery is at least 85 mol % and propane recovery is at least 99 mol % (see table 1).

Regarding claim 16, Lee et al discloses a natural gas liquid plant that comprises a separator (34a) that is configured to receive a cooled low pressure feed gas and that is fluidly coupled to an absorber (28a) and a demethanizer (28) (see figure 4 and column 9, line 35 through column 10, line 14).

Lee et al does not disclose wherein the plant is further configured such that refrigeration duty of the absorber and demethanizer is provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas and an expansion of a

vapor portion using a device other than a turboexpander, and wherein the demethanizer is configured to receive the expanded liquid portion as demethanizer.

However, Lee et al discloses an expansion device is between the reflux exchanger (26) and absorber (28a) (see figure 4).

Campbell et al discloses a deethanizer is configured to receive the liquid portion that is reduced in pressure as a deethanizer feed stream and a separator/absorber (15) is configured to receive an expansion of a vapor portion using a work expansion machine (13) (see figure 3 and column 8, line 31 through column 9, line 4).

Campbell et al does not disclose a primary and secondary cooler and a demethanizer.

It would have been obvious tone having ordinary skill in the art at the time the invention was made to modify the teachings of Lee et al with the teachings of Campbell et al such that refrigeration duty of the absorber and demethanizer are provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas and an expansion of a vapor portion using a device other than a turboexpander, and wherein the demethanizer is configured to receive the expanded liquid portion as demethanizer in order to substantially reduce the utility requirements (cooling, reboiling, refluxing, and/or re-compressing) needed for the recovery of the desired products (see column 2, lines 37-51).

Regarding claim 17, Lee et al does not disclose a NGL plant further comprising a cooler that is configured to further cool the cooled low pressure feed gas using an expanded liquid portion of the cooled low pressure feed gas as a refrigerant.

Campbell et al discloses a separator (11) that is configured to allow separation of a cooled low pressure feed gas into a liquid portion, and a first pressure reduction device (12) that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion to provide refrigeration for a first cooler (10) that is fluidly coupled to the separator and that is configured to allow cooling of a low pressure feed gas to thereby allow formation of the cooled low pressure feed gas (see figure 3 and column 8, line 31 through column 9, line 4) such that a cooler that is configured to further cool the cooled low pressure feed gas using an expanded liquid portion of the cooled low pressure feed gas as a refrigerant.

Regarding claim 18, Lee et al discloses a NGL plant wherein the absorber is configured to produce an absorber bottom product that is fed to the demethanizer as reflux (see figure 4).

Regarding claim 19, Lee et al discloses a NGL plant wherein the separator (34a) is configured to separate a vapor portion from the cooled low pressure feed gas and a valve is configured to introduce the vapor portion into the absorber (28a) (see figure 4 and column 9, line 35 through column 10, line 14).

Lee et al does not disclose a Joule-Thompson valve.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a Joule-Thomson valve to further cool a first part of the vapor portion for introduction into the absorber, since it was known in the art that a Joule-Thomson valve is an expansion device that cools the fluid as it expands the fluid (see MPEP 2144.03 (A-E)).

Regarding claim 20, Lee et al does not disclose a NGL plant wherein a second part of the vapor portion is expanded and cooled in a turboexpander.

However, in another embodiment Lee et al discloses a separator (34) that is configured to separate the cooled low pressure feed gas in a liquid portion and a vapor portion; the vapor portion is split such that a portion is sent to a work expansion device (40) and another portion is sent to a pressure reduction device (100) (see figure 1 and column 4, line 56 through column 5, line 40).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the embodiment represented by figure 4 with the embodiment represented by figure1 to enhance ethane and NGL recovery efficiency by generating a colder and leaner reflux stream for the top rectification section of the demethanizer.

Claims 3, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,354,105 B1) and Campbell et al (US 5,771,712) as applied to claims 1 and 9 above, and further in view of admitted prior art.

Regarding claims 3 and 12, Lee et al does not disclose a NGL plant wherein a plurality of side reboilers that are thermally coupled to the demethanizer and that are configured to cool a portion of the low pressure feed gas.

The admitted prior art discloses that it is known to have a NGL plant wherein a plurality of side reboilers that are thermally coupled to the demethanizer and that are configured to cool a portion of the low pressure feed gas (see figure 1 and page 1, lines 10-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Lee et al with the teachings of the admitted prior art such that a plurality of side reboilers that are thermally coupled to the demethanizer and that are configured to cool a portion of the low pressure feed gas in order to provide additional cooling to the feed gas.

Regarding claim 14, Lee et al discloses a NGL plant wherein the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant.

However, in one embodiment Lee et al discloses a primary and secondary cooler (see figure 1) and in another embodiment Lee et al discloses a cooler employs as least one of external ethane, external propane and another cooler employs the absorber overhead product as refrigerants (see figures 3-4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the embodiment of figure 1 with the embodiment of figures 3-4 such that the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant in order to provide additional cooling to the inlet gas (see column 9, line 65 through column 10, line 8).

The admitted prior art discloses that it is known to have a NGL plant wherein the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant (see figure 2 and page 2, lines 6-25).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Lee et al with the teachings of the admitted prior art such that the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant in order to enhance ethane and/pr propane recovery.

### *Response to Arguments*

Applicant's arguments, see Remarks, page 9, filed September 26, 2008, with respect to the objections of the specification and claims 4, 11, 17, and 19 have been fully considered and are persuasive. The objections of the specifications and claims 4, 11, 17, and 19 have been withdrawn.

Applicant's arguments, see Remarks, page 9-11, filed September 26, 2008, with respect to the rejection(s) of claim(s) s 1-3, 5, 8, and 16-20 under U.S.C. 102(b) and claims 4-7 and 19-20 under U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Lee et al (US 6,354,105 B1), Campbell et al (US 5,771,712), and admitted prior art.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. Y./
Examiner, Art Unit 1797

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797